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# Amateur Television Quarterly

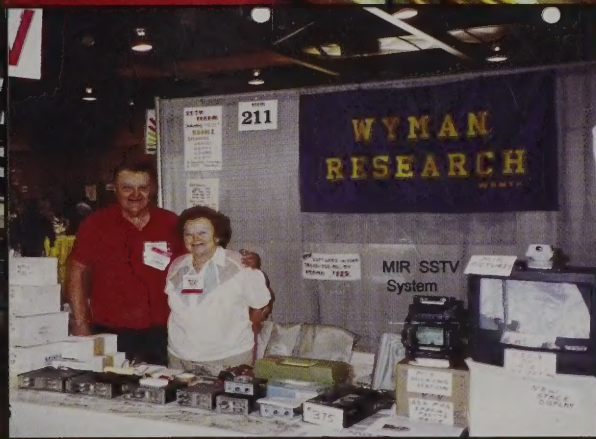
Remembering Don Miller W9NTP

DATV Power Amps

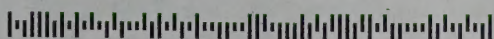
Dayton Activities

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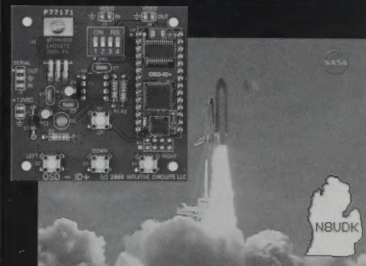
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# Sync Buzz Editorial

-Mike Collis WA6SVT

## In this issue

We regret to inform our subscribers of the passing of ATV and SSTV pioneer Don Miller W9NTP. Don owned Wyman Research, a company that manufactured ATV and SSTV equipment.

He was a collector of artifacts, Past ARRL Central Division Director. During WW2 was in the US Army signal corps then transferred to the Trinity weapons test site in New Mexico to work on the Manhattan Project. Don shared story about the project and showed us a couple of his artifacts at the 2013 Friday night ATV Dinner at Dayton. See "Remembering Don Miller" article in this issue on pages 8-11 and A Tribute to Dr. Don Miller W9NTP, ATV Pioneer on pages 12-14 for more details about his SSTV and ATPioneering.



## Dayton Activities

The annual ATV Dinner during the Dayton Hamvention will be at Roush's restaurant in Fairborn Ohio on Friday evening.

<http://www.atvquarterly.com>

Great food and a great group of ATVers from around the country and sometimes from outside the country are in attendance each year. See the map and directions to the dinner on page 6.

There will be a high altitude balloon launch on Friday afternoon after the BalloonSat Forum that will be carrying SSTV this year on 2 meters. ATV Forum chaired by Art Towslee WA8RMC will be held on Saturday at the Hamvention. Room 2 starting at 12:15 PM.

We look forward to seeing you all at the ATN booth at the Hamvention. We have a Dayton special for new subscribers and renewals at the hamvention.

## In the next issue

We will have articles about Raspberry Pi video ID, FM voice intercom receiver, Streaming ATV via the BATC site, and ATN news.

Stay tuned - Bill & Mike

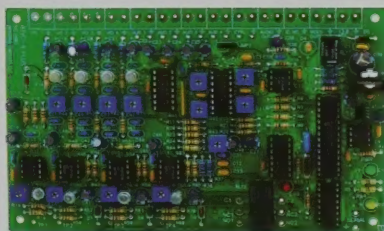
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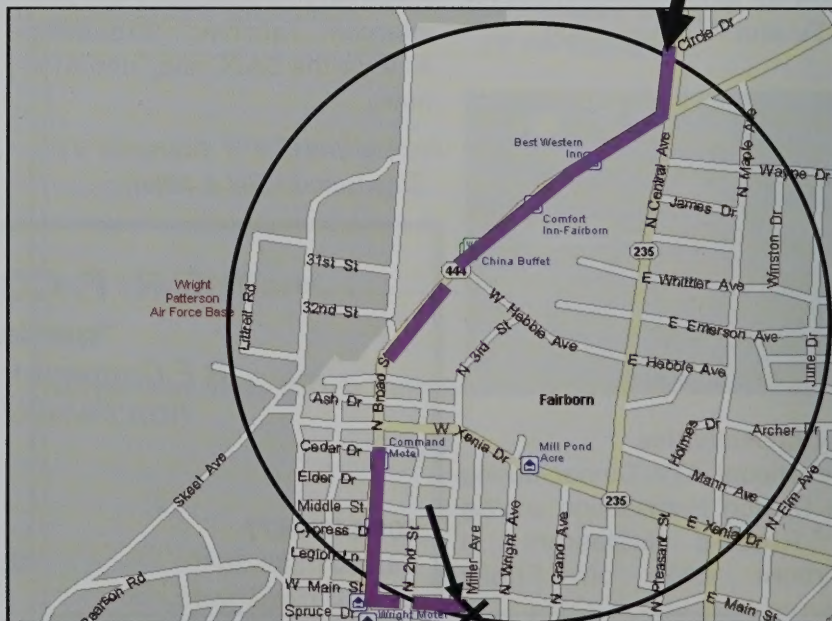
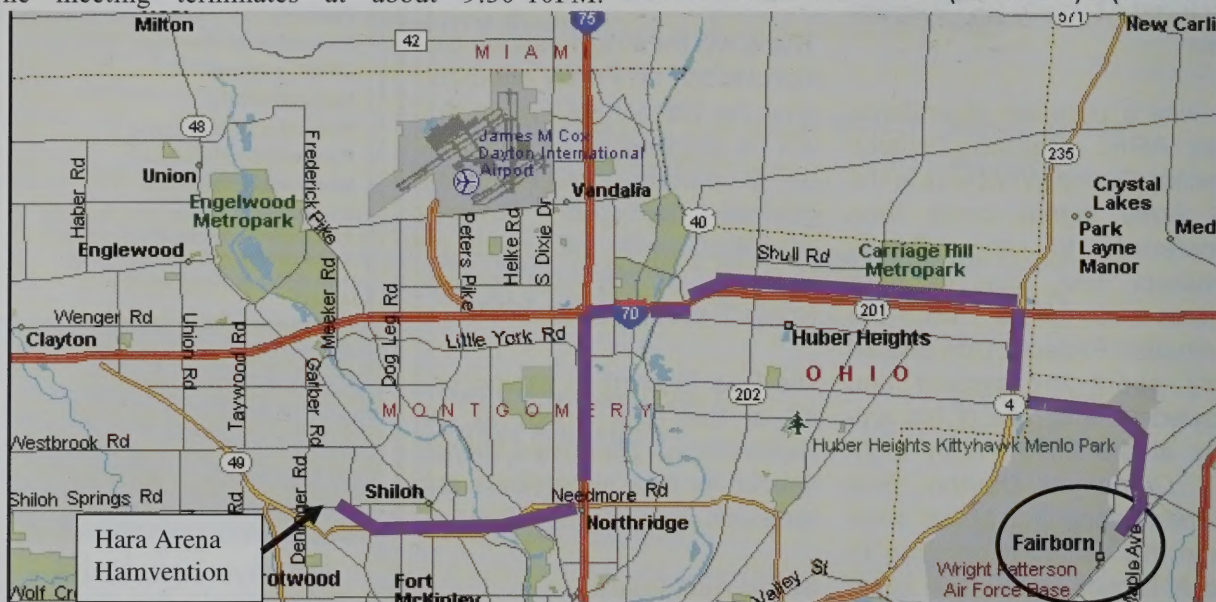


**-ATVQ Staff**

It will be held on Hamvention Friday from 6 till 10PM at Roush's Restaurant 305 W Main St. in Fairborn, OH 45324 (at the north end of Wright Patterson airfield runway). The dinner menu is varied, moderately priced and ordered separately. We will enjoy a sit down dinner then have speakers talk about various ATV topics. We will also include door prizes for those present.

Directions: Take I-75 north then I-70 east. Exit SR 235/ SR4 south (Fairborn exit). South on 235 about 1 mile then left on Chambersburg Road (east & still SR235 past airport runway). Right on N. Broad Street for about 10 blocks. Turn left on W. Main Street for 3 blocks to Miller Ave. Roush's is on corner of W. Main and Miller. Parking in rear.

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### ATV Forum:

Saturday starting at 12:15 in room 2. Our Moderator this year will be Art Towslee WA8RMC. The forum will consist of several presenters giving short talks about the ATV mode, equipment, practices and the latest state of the art in ATV. A five minute Q&A time slot follows each presentation.

12:15-12:20 "Introductions" by our Moderator.

12:25-12:35 "Life after the PC, Analog TX/RX" by Gordon West WB6NOA.

12:40-1:00 "Getting started in Digital Amateur Television" by Mel Whitten K0PFX.

1:05-1:30 "VSWR: Why it does not mean as much as you think (for ATVers)" by Dr. Al Torres KP4AQL.

1:35-1:50 "Linked ATV Repeaters in the Southwest" by Mike Collis WA6SVT.

1:55-2PM "Forum Wrap up" by our Moderator Art Towslee WA8RMC.

### SSTV Balloon Launch



Will take place Friday afternoon following the BalloonSat Forum. SSTV will be transmitted on 2 meters. More details at the BalloonSat Forum. Below is a photo

taken from a past balloon launch showing the size of the swap meet area surrounding the Hara Arena.



### ATN Booth

This year Amateur Television Network will have a club booth. A great place to find out the latest in ATV and ATV events at the Hamvention.

Many of us meet at the booth Friday late afternoon then caravan over to the ATV dinner. ATV handouts including sample ATVQ issues. We will have a Dayton special for new and renewing subscribers.

We are planning an ATV demo of DATV Express and HiDes DVB-T equipment in operation. Please stop by and see us, We would like to get your input about ATVQ and anything about ATV.



See you at Dayton!

Bill and Mike



## Remembering Dr. Don Miller, W9NTP

Born May 25, 1923--Silent Key March 22, 2015

How Did the MIR SSTV System come into Existence? -Farrell Winder, W8ZCF

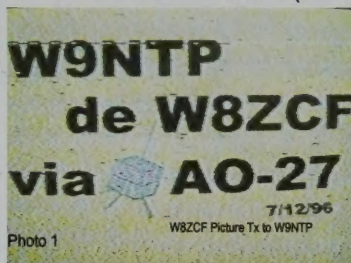


In my activity in Amateur Radio beginning in 1941 there have been many very interesting experiences. One especially stands out as exciting with a strong feeling of accomplishment. This was the association with Don Miller, W9NTP in planning and successfully implementing a small packaged SSTV System for the Mir Space Station. I know Don also had a similar feeling of mutual reward for our efforts in concluding a History making event.

How did the MIR SSTV system come about? For those who knew Don, he had a way of presenting a friendly challenge that one just had to pursue. For example, I was trying to make voice contact with Dr. Shannon Lucid who was aboard the MIR Space Station. Don had already accomplished this and I was trying with hit or miss methods. Don pointed out this was not good practice and to do it suggested the only real way was to get a tracking program using Keplerian elements. I pursued Don's suggestion and became very successful in tracking space vehicles and I am still using the program today. Now with precise tracking Don and I then went on to several satellite experiments with voice contacts via the satellites.

One was using AO-27. This satellite had been a strictly FM voice contact media for contacts between wide spread ground stations, 145.850 MHz up to the satellite and 436.805MHz down.

Since Don and I had good success in SSTV terrestrial exchanges, we thought about a more advanced idea of exchanging an SSTV picture via this satellite. After a few tries in getting lined up properly with a good position for our antennas we had the first known exchange of pictures via AO-27. See Photos (1 & 2). With this exciting



event we thought about an even more advanced idea. *Would it be possible to get a small SSTV station aboard the International Space Station or the MIR Space Station that could send pictures from space to Amateur Radio operators and other viewers on Earth?*

Having heard that 2 amateur operators, Dr. David Larsen, N6CO and Miles Mann, WF1F had been successful in putting an amateur radio transceiver aboard MIR, we decided to contact N6CO and WF1F to pursue our SSTV concept. N6CO and WF1F had formed an association among themselves, called "MAREX" (MIR International Amateur Radio Experiment to promote Amateur Radio Satellite Systems). They had been working with Sergej Samburov, RV3DR, Chief of the Cosmonaut Amateur Radio Department in Russia.

Don and I arranged a long telephone conference call one evening on May 23, 1997 with N6CO and WF1F. I believe it was Don, W9NTP's very vivid descriptive performance of what SSTV could do that was convincing enough to quickly result in approval among all 4 of us to proceed pending further approval.

Miles contacted Sergej Samburov, explained our idea and in short time received approval from the Russian authorities to develop our concept. A plan was immediately implemented among us to come up with an SSTV package with specifications that could be approved in Russia.



As there was no funding available, it was necessary to depend on our own efforts plus generous sponsors for the building blocks. Don, W9NTP was already familiar with the Tasco Scanner for sending and receiving SSTV, having contacts with Tasco Electronics, Ltd in Japan. The Tasco is a stand alone package for the processing of SSTV, providing for an NTSC video input and formatted SSTV output for feeding an input to an RF transmitter. A remote control provides selection of stored pictures.

Don was also familiar with a Tasco Docking Station. This unit has a 5 inch screen for displaying a captured camera input. Don arranged for these items from Tasco Ltd., Japan. I arranged for small cameras from Apple Computer, the type used in conferencing meetings.

Miles arranged for the Kenwood Corp to supply their TM-V7A, a dual band transceiver. A key item to complete the package was an automatic controller for unattended operation. This was engineered and developed by Hank Cantrell, W4HTB who became interested in our concept and joined us for much needed assistance. Hank's controller also supplied a CW ID, "R0MIR" an FCC requirement. Robot 36 was selected for the operating mode providing a picture in 36 seconds with the capability of repeating or a new picture every 2 minutes. Hank also did the final mechanical assembly of all the above items. (See photo 3). MIR SSTV video was transmitted



on 145.985 MHz and voice exchange on 437.975MHz. Communications in the USA took place with the Russian Cosmonauts but was restricted due to the language barrier.

However, when Jean-Pierre Haignere, French Cosmonaut came aboard we had excellent exchanges in English or French along with many new pictures. Hank and Chris Scott, W4NEQ did an admiral job by test flying the completed MIR System on 2 different flights to simulate operation aboard MIR.

Many perfect pictures were received by all those within range on the ground. Russia



required 4 systems to be built, one as a spare and all 4 systems were required to be tested and approved in Russia. We actually built 5 systems. Miles arranged for transportation of the units to Russia and while there, stayed to train the cosmonauts that would go aboard MIR a few months later. We eventually learned that one of the units would be sent via the Russian Soyuz cargo ship to MIR for installation within the Space Station sometime in late 1998. Miles got a message from Sergej Samburov on December 12, 1998 that pictures would start and immediately called me. I called



Don and he set up to receive. He copied the 1st picture, (See Photo 4). This picture shows the MIR SSTV system in the background which was captured and sent by Commander Gennady Padalka.



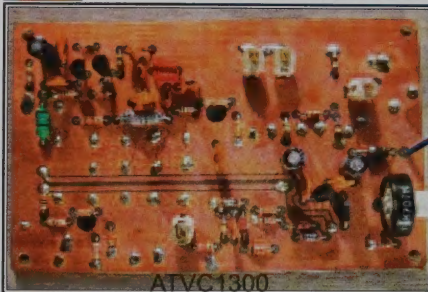
Continued on page 11



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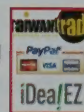
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 NF 2 dB 10 dB gain



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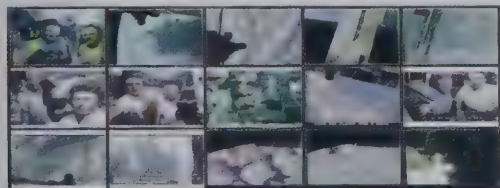
**HV-110 DVB-T Receiver \$169**




HV-110 is a 1080 Full HD Ham TV receiver box and decodes DVB-T. Outputs are HDMI & CVBS. Frequency range is 170-950 MHz, 2-8 MHz bandwidths supported.

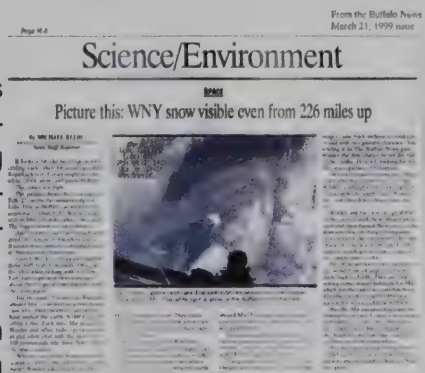


I copied many pictures. (See photo 5).



Thousands of other pictures followed including pictures within the station as well as pictures taken through one of the port holes of Earth and Space. Mir continued sending pictures worldwide for periods between December 1998 through April 23, 2000. Mir was deorbited into the Pacific Ocean March 23, 2001. The time line for the Mir SSTV development was 13 months. At 19 months and about 3000 e-mails which I processed, Don, W9NTP received the first great and exciting perfect picture from MIR!! Some 50 magazine and newspaper articles were compiled during MIR's active SSTV transmission periods.

Many of the articles were very interesting such as the one by Michael Beebe of the Buffalo, NY News.



MIR SSTV was a favorite discussion among Amateurs during MIR's picture activity.

As many Dayton Hamvention

attendees may remember, Don exhibited his Wyman Research Products every year. Don and his wife Sue, W9YL in 1999. Note that he was showing one of the MIR SSTV units and had it rigged to automatically sequence many of the received pictures from MIR.



Enough words cannot be expressed about Don's Engineering, Research and Innovative abilities to enhance and promote Amateur Radio including SSTV and fast scan ATV.

He did this not only in the USA, but often continued mobile with voice and SSTV activity in some of the 200 countries that he visited.

We will greatly miss this talented Amateur Radio Operator.

73,  
Farrell W8ZCF



## A Tribute to Dr. Don Miller W9NTP

### ATV & SSTV Pioneer

-Bill Brown WB8ELK



Don Miller W9NTP

I first met Don Miller W9NTP (SK) shortly after I received my ham radio license in 1969. I was fascinated by Slow Scan TV (SSTV) and Fast Scan ATV and he was one of the pioneers for both modes. I've visited his Wyman Research business and his amazing home and private museum many times over the ensuing years and have come to know his many talents as a mentor, teacher, engineering genius and archaeologist.



Don's 70cm ATV Transceiver

Don has always been at the forefront of technology and worked on the Manhattan Project during WWII. Whenever I visited he would tell me the story of walking into Oppenheimer's office, explaining to him that he was a ham radio operator and that he could help set up communications for their big test firing.

As a result, Oppenheimer brought Don along as part of the team for the test of the World's first nuclear explosion at the Trinity site near Alamogordo, NM.



Don had a passion for archaeology and was a real-life Indiana Jones. He's explored the World and has likely visited more countries than currently exist on this planet. He has been collecting artifacts for over 80 years and has amassed a most amazing collection that he has displayed in his incredible museum. He even bartered for items from a cannibal tribe in New Guinea and fortunately for Don, they weren't hungry at the time. No visit with Don was complete until he had given you the tour of his collection along with the many fascinating stories that went along with each item.





**Don's Museum & Canoe from New Guinea**



He also had a passion for the piano and organs. He obtained a 1920's Wurlitzer theatre organ that had been in a storage unit and spent several years having it restored in his house. His attic is filled with the pipes from the organ which are all pneumatically activated by a giant air blower. When he plays it, the whole house reverberates with the amazing sound. During our last visit with

Don and his delightful wife Sandy KC9SME this past Summer, it



was a real pleasure to hear him play the organ and feel the sound surround us.

Don helped develop Slow Scan TV along with SSTV inventor Copthorne Macdonald VY2CM and was honored as Amateur of the Year at the 1972 Dayton Hamvention. Some of my very first SSTV and ATV contacts were with Don and I always enjoyed seeing his strong signal during band openings with his signature ATV ID of a skull with his call letters above it. **Don's ID**



Don's SSTV articles in QST were an inspiration to me and I've built a number of SSTV systems based on those early articles. Don invited Cop Macdonald VY2CM to his SSTV Forum at the Dayton Hamvention a couple of years ago and I had the great pleasure to meet Cop at that time. Don moderated the SSTV Forum at Dayton for many

years and it was always a popular and well-attended forum.

Don and Sue Miller W9YL (SK) founded Wyman Research in the early 1980's and marketed a wide array of ATV and SSTV equipment. I remember that one of his ATV transmitter innovations was the ability to send audio by FM modulating the ATV carrier which allowed you to receive sound even with a very weak picture. I had the opportunity to test the second-ever high altitude balloon carrying ATV in Don's Wyman Research lab on June 4<sup>th</sup>, 1988 until the wee hours of the morning before launching it from a nearby grass airstrip. The ATV payload was built by Bob McAuliffe



W9PRD using one of Don's ATV transmitter boards and was seen hundreds of miles away during the flight. .

Don was also part of the team that arranged to have an automated SSTV transmitter sent up to the Russian MIR orbiting space lab. See the article on page 8 about how this all came about.

We attended Don's services at his church in Indiana this past March. It was obvious from all the stories and testimonials that Don has been an inspiration and a positive influence on a great many lives and will be greatly missed

Bill WB8ELK



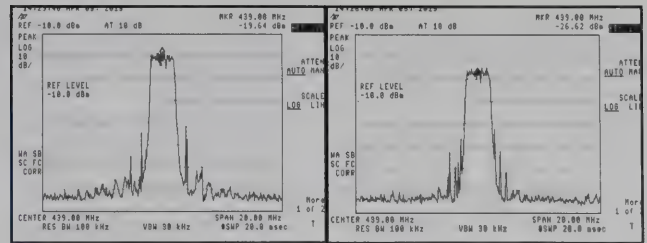


# DATV-EXPRESS DVB-T POWER AMPLIFIERS

-Art Towslee WA8RMC

The DATV-Express board is capable of generating a +10dBm DVB-S +1dBm DVB-T signal. (See [www.DATV-Express.com](http://www.DATV-Express.com) for details). Either of these signals is not much good without amplification. So, what follows are details for a few DVB-T post amplifiers to boost it to a more manageable level. This goes for all other DATV transmitters on the market also, not just DATV-Express. However, the Express board has a cleaner signal, the output is higher and covers a 70 to 2450MHz frequency range. The cleaner signal is the most important parameter because as you add amplifiers, the signal gets degraded thereby limiting the number and types of post amplifiers. In general, signal distortion (spectral re-growth) can be tolerated until it rises to about 20dB below the top of the haystack. For comparison, broadcast industry limits re-growth to greater than 40 dB below top of the haystack (-40dBc) prior to the final amplifier.

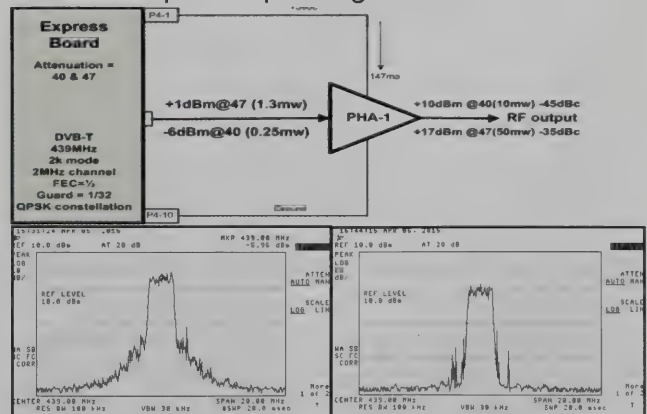
First, let's start by looking at the Express board output at minimum attenuation (setting 47 left graph) and then again with 7dB of electronic attenuation inserted (setting 40 in right graph). Note a slight amount of distortion re-growth on either side of the main carrier on the left. This is due to a slight amount of non-linearity introduced in the Express internal MMIC amplifier at that signal level. It's down about 50 dB from peak carrier which is good but later we'll see what that does to the signal as amplifier stages are added. (The signal peaks to the left and right of the signal are a result of limited software oversampling in the program and can't be avoided here).



## Setting 47 Express Board Setting 40

Now, let's look at a 439MHz application using a simple amplifier addition to see how much output power can be achieved. A good selection is a Minicircuits type PHA-1 wide band MMIC. It operates from 50MHz to 6GHz on +5VDC, has about 15dB of gain (I measured 16) and is relatively cheap at around \$3.00 in small quantities. It's powered directly from Express with only a small modification.\*

Express is first set for its maximum DVB-T attenuator setting 47 for +1dBm (1.3mw). The single PHA-1 amplifier output in the left graph is about +17dBm (~50mw). That's good for a simple addition to Express but generally not high enough for most practical applications. Also the re-growth increased noticeably. If this is the final output, it's OK (re-growth at -35dBc) but in order to add another amplifier stage, the output must be reduced to minimize re-growth here and prevent the next amplifier input stage overload.



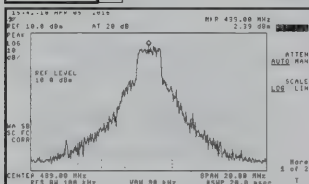
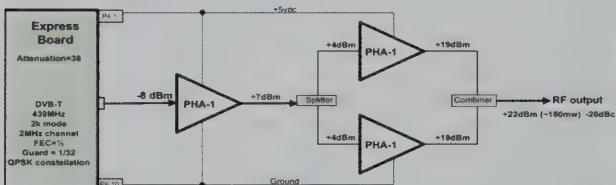
## Setting 47 Single PHA-1 Setting 40

To increase the output it gets a bit more complicated but not that difficult, so stay with me! Since the single PHA-1 can only tolerate a +6dBm maximum input signal without distortion, an added single amplifier after the first one at Express full output is not practical.



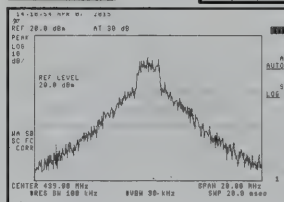
Instead, parallel two PHA-1' switch a signal splitter on the input and a combiner on the output. That way the pair can be fed with twice the signal a single device could accept and maintain the same gain. (The signal is reduced by 3dB at each input but increased by 3dB at the combined output). The Express output must then be reduced to about -8dBm so the first amp outputs +7dBm (15dB gain) and then split into two +4dBm signals to feed the parallel combination. Then the two +19dBm outputs (4dBm+ 15dB) re-combine to produce one +22dBm (~160mw) signal. This output signal has enough re-growth distortion to put it about 20dB down from the top of the haystack signal. 160mw is now high enough for short range over-the-air communications.

If a cleaner signal with lower re-growth distortion is desired, it will be necessary to lower the Express signal feeding the amplifiers for a corresponding reduction in signal output. There is NO FREE LUNCH HERE! The single and parallel combination can still operate from the Express board internal +5VDC source.\*

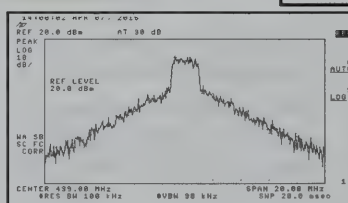
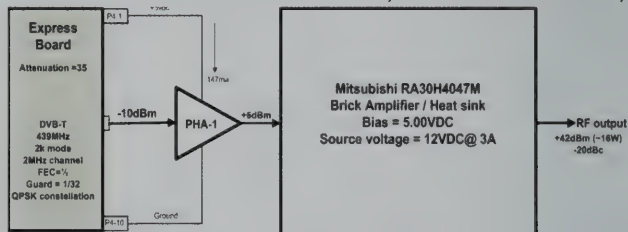


OK, so much for the simple PHA-1 amplifiers. To output still **more** power I'll first try to discard both PHA-1 amplifiers and

use a high power "brick" amplifier instead. The Mitsubishi RA30H4047M amplifier will accept the signal from Express and output about 8 watts without any intermediate amplifier. However, it costs about \$40, it must be sourced from a separate +12VDC 3 amp supply, it must be installed on an appropriate heat sink / cooling fan and the best output signal obtained is inferior to the PHA-1 amplifier arrangements. However it **could** be adequate for DATV applications if a band pass filter is used to eliminate the distortion spectral re-growth sidebands. The best compromise I got with the below arrangement was 8 watts out with re-growth down only 15 dB.



A reason the above combination does not look good is because the Express output is set at maximum to get enough signal through the brick amp. At that level, as I said before, there is a slight amount of re-growth in the Express output at the 47 attenuation level. It is not noticeable there but when it's passed through a ~50db brick amplifier and added to some inherent brick amp non-linearity, it becomes almost unmanageable as seen in the graph. A solution is to lower the Express output and add a single PHA-1 intermediate amplifier between it and the brick amp. As a result, re-growth is lowered and maximum output is raised, a worthwhile achievement. So, after all the effort,



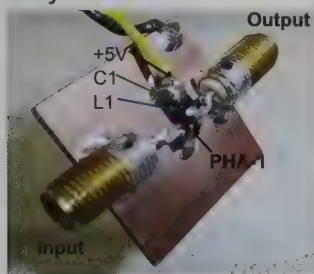
what is learned here? DATV DVB-T amplifiers are possible but it's not easy to obtain "broadcast quality" signals. Small distortion

signal components can make a huge difference in the end result. Remember also, the re-growth sidebands in the power output envelope do not contribute toward a better signal. Just because the "Bird" wattmeter shows an increase in output may not mean the signal is stronger or better!!! About 16 watts true power is achievable with sidebands 20dB below haystack top.

\* The Express board was designed to supply power for an external low current SWR amplifier. Therefore the +5V output at P4-1 will not supply enough current for a PHA-1 amplifier. R31 (49.9 ohms) in series with the DC supply must be removed and a jumper installed. (Do not short this line with R31 bypassed).

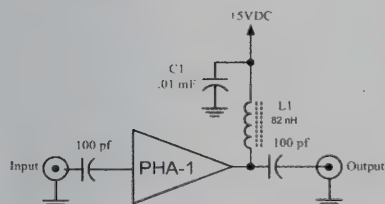


OK, how about DVB-S applications. DVB-S operation is mostly, if not all, on the 23cm 1240-1300MHz band due to the availability of inexpensive DVB-S satellite receivers designed for 940-2150 MHz without modification. Since the maximum Express DVB-S output is about +10dBm (10mw), a single PHA-1 amplifier can't be used because it's limited to about +6dBm at its input. So, if more output from a DVB-S signal is needed, start with the dual PHA-1 amplifier that will handle +10dBm at the input. However, that's subject matter for another article tailored just to DVB-S so stay tuned.



### Single PHA-1 amplifier construction details:

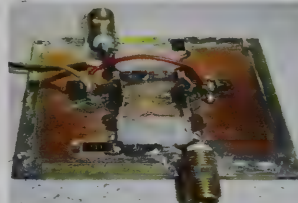
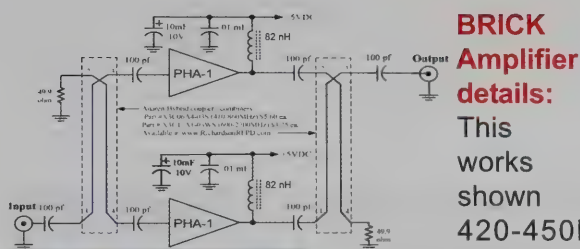
This amp is good for 439-1280MHz without change. It'll handle up to about +6dBm at the input and will give about 15-16dB gain @ 439 and about 11-12dB @ 1280. I assembled it on a piece of G10 circuit board 1" square. Connectors are SMA. Amplifier draws about 150mA from the 5V supply. Caps = 50 to 100 pF. L1= 82nH.



### Dual PHA-1 amplifier details:

This amp is good for 439 and 900MHz operation using the Anarzen X3C06A4-03S splitter/combiner (\$5.60) and 1200- 2400MHz with the Anarzen X3C17A1-03WS (\$3.75) available in the USA at Richardson Electronics ([RichardsonRFPD.com](http://RichardsonRFPD.com)). The dual arrangement allows twice as much input signal with the same gain as a single unit. It draws about 290ma. I used a piece of 2" x 2" blank G10 circuit board and used a "pad cutter" to create small isolated circuit pads. I then laid the surface mount parts on the pads as shown in the pictures above.

(See how to make a pad cutter at <https://www.youtube.com/watch?v=uFLdDTT5-wk>. The video shows how to create your own tool for it. (I apologize for the crude look of my prototype. I didn't clean it up for the picture). Some pads were removed to clear space for components.

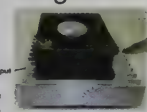
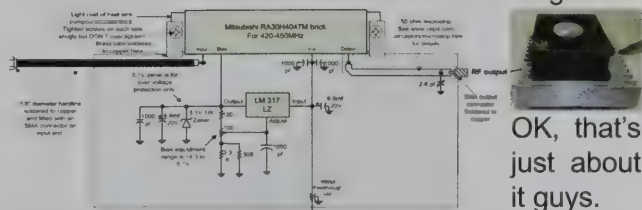


### BRICK Amplifier details:

This amp works as shown for 420-450MHz

operation. I assembled the circuitry on a piece of 1.5" x 5.5" blank G10 double sided circuit board. Note that I folded pieces of thin brass shim stock around

all edges so the bottom copper totally connects with top copper breaking it only at the brick output wire. Here again, I used a pad cutter to fabricate isolated pads to connect SM components. The output trace is a strip line 0.120" wide. (See [www.cepd.com/calculators/microstrip.htm](http://www.cepd.com/calculators/microstrip.htm) for calculation details). Note the 2-6pF cap on the output line. It may not be needed but improved the match enough to make it worthwhile. Placement is not critical. I made the bias voltage adjustable but it may as well be fixed at 5.00V. Just be careful to test the line for correct voltage **BEFORE** connecting it to the brick. The 5.1V zener is there just in case.... Maximum brick voltage is 5.25V and is NOT forgiving of mistakes. I used 6.8mF 20V tantalum filter caps but good electrolytics over 1mF are ok too. Final points: I used brass tabs soldered to the board and placed over the brick mounting screws as shown. These are very important to prevent oscillation. Also, use a THIN coat of heat sink compound and brick mounting screws with lock washers. Tighten snugly but **DO NOT** over tighten. If too snug, the brick will warp and crack the internal ceramic substrate. That would NOT be good!



OK, that's just about it guys.



I will treat the DVB-S subject in more depth in another article. ...Art WA8RMC



## DVB-T DX-Pedition

*-Jim Andrews, KH6HTV*



**Fig. 1** The ultimate proof ! Live, high-definition, 1080P, image received by N0YE in Boulder, Colorado from KH6HTV in Cheyenne, Wyoming.

### **SUMMARY: 10 Watt, 70cm, DVB-T signal successfully transmitted over 77 miles using conventional Yagi Antennas.**

In 2011, the first attempt at long distance amateur Digital Television (DTV) DX was made by a group of Boulder hams [1 & 2]. The hams participating were: Don, N0YE, Jack, K0HEH, Roger, K0IHx, Bill, K0RZ, and Jim, KH6HTV. They operated on the 70cm band and were using CATV 64-QAM modulation. Jim drove to Cheyenne, Wyoming and set up a portable transmitting station with a 5 watt signal and a 6 element yagi antenna. A successful one-way contact was made back to Boulder, but it was only possible due to Bill using his giant Moon-Bounce antenna array ( +27dBi gain) with very low noise (0.3dB NF) preamp mounted on the antenna. Bill reported a receive margin of 7dB for the 75 mile path from Wyoming to his QTH.

In 2014, the Boulder TV hams discovered DVB-T, the European standard for Digital Video Broadcast -Terrestrial [3]. They have found for over the air transmissions, DVB-T far outperforms the CATV 64-QAM modulation, particularly in terms of receiver sensitivity and tolerance for multi-path. During the summer and early fall, Boulder TV hams have been performing numerous experiments to test the limits of DVB-T propagation, both on the 70cm band and also the higher amateur radio microwave bands. Until now, all of these experiments were confined to the Boulder valley.

In October, the Boulder TV hams decided that we now needed to repeat the Wyoming to Colorado DTV experiment of 2011, but to see if we could now make it work using conventional, yaggi antennas, instead of a giant moon-bounce antenna array. This time, we wanted the stations to be the same as ordinary TV hams might use. Hams participating this time were: Don, N0YE, Jack, K0HEH, Roger, K0IHx and Jim, KH6HTV. Both Roger and Don's QTHs are in excellent radio locations, situated on ridge lines just south of the city of Boulder with excellent views to the north towards Wyoming. Roger is at: 39° 58' 21" x156 11 03 W, 5650 ft. Don is at 39° 58' 08" W x 105 15' 06" W, 5675 ft. Jack and Roger pooled their equipment at Roger's QTH. Both stations were using Hi-Des model HV-110 DVB-T receivers along with yaggi antennas and low-noise preamps for receiving. They were also equipped with Hi-Des model HV-100EH DVB-T modulators and rf power amplifiers for transmitting.

On October 28th, Jim, KH6HTV, drove north to Wyoming and set up his 70cm, DVB-T transmitter at the same identical location as used in 2011. ( 41° 2' 53" N x 104° 53' 26" W, 6,265 ft. elevation). His portable station consisted of a Hi-Des model HV-100EH DVB-T modulator driving a KH6HTV Video model 70-9A linear power amplifier outputting 10 Watts avg. (+40dBm) on channel 58 (429 MHz) with a 6 MHz bandwidth. He used a KLM, 6 element yagi antenna (+11dBi) on a 10 ft. mast with a short, 15 ft. length of 1/2", low loss (< 0.3dB), semi-flex coax cable. The ERP was thus about +51dBm.



For receiving he also used a Hi-Des, model HV-110 receiver and a low noise (0.8dB NF) ARR model P432VDG preamp plus a Haier 7" color LCD receiver/monitor. For video sources, he used a Canon hi-def, 1080P, camcorder with HDMI output and also a portable DVD player playing a continuous looping DVD slide show outputting a 480i composite video signal. While driving north from Boulder, Jim transmitted a continuous beacon signal from his car using the DVD player as the video source. While in motion, he used a Diamond model NR2000A, mobile whip antenna (+6.5dBi) on a Diamond mag. mount with a 15ft. cable (-1.5dB loss). Thus the mobile ERP was approximately +44dBm.

**RESULTS:** While Jim was driving north from Boulder, the hams back in Boulder were able to receive his mobile DVB-T signal reliably out to about 8 miles and intermittently out to about 25 miles. No mobile flutter was noted up to the maximum speeds traveled of 75mph. From the Cheyenne site, only Don, N0YE, was able to receive a DTV picture and audio. Don inserted a calibrated Weinschel 1dB/10dB step attenuator in his antenna feed line ahead of the preamp and determined that his receive margin was 6dB with a measured DTV signal to noise ratio of 11dB. Without the preamp, his receive margin was only 1dB ! Without the preamp, the Hi-Des receiver's on-screen display of received power level and signal to noise ratio read -91dBm and 11dB respectively. Adding the 16dB gain preamp, the values were -75dBm and s/n = 13dB. The photographs in Figs. 5&6 were taken by N0YE of the high-definition (1080P) pictures he was receiving from Cheyenne.

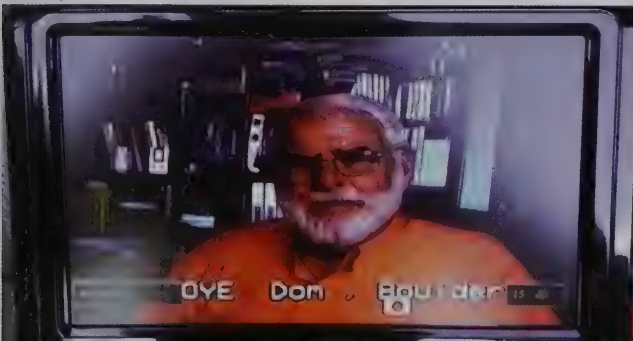


Fig. 2 N0YE's live, 70cm, DVB-T transmission

from Boulder as received by KH6HTV in his automobile at the Mead AT&T microwave site on I-25. 24 mile distance, 19dB receive margin.

After the successful transmission of DVB-T from Cheyenne to Boulder, we next attempted to transmit DVB-T the other direction from both K0IHx's and N0YE's QTHs. These were unsuccessful. We also attempted to make contact on 23cm using both DVB-T and FM-TV with 3 Watt (+35dBm) transmitters. These attempts were also unsuccessful. On the way back to Boulder, Jim also set up operations at an AT&T microwave relay station on I-25 near the Mead exit ( 40° 14' 36" N x 104° 58' 47" W, 4980 ft.). Over this 24 mile path, N0YE and KH6HTV were able to establish reliable (+19dB margin), two-way, DVB-T QSOs on 70cm. See Fig. 2 lower left.

**THEORY:** So, how did our results compare to theory ? See reference [4] for a discussion of the relevant propagation theory. The key equations are as follows:

$$\text{Rcvr Pwr(dBm)} = \text{Trans Pwr (dBm)} - \text{Trans Cable Loss (dB)} + \text{Tran Ant Gain (dBi)} - \text{RF Path Loss (dBm)} + \text{Rcv Ant Gain (dBi)} - \text{Rcv Cable Loss (dB)}$$

$$\text{RF Path Loss(dB)} = 20 * \log_{10} (f \text{ in MHz}) + 20 * \log_{10} (D \text{ in Miles}) + 36.6 \text{ dB}$$

The total distance was 77 miles and the frequency was 429 MHz. Thus, the theoretical, free space, RF Path Loss would be 127 dB.



Fig. 3 N0YE's 70cm Yaggi antenna looking north towards Wyoming.



The 12 element Yagi receive antenna, Fig. 3, was built by N0YE from the K1FO design in the ARRL handbook. Don estimates that it's gain was about +12dBi. Don's antenna feedline coax loss was 3.2dB. The transmit, KLM, 6 element yagi antenna, Fig. 6, gain was measured to be +11dBi [5]. Thus, putting all of these numbers in the above equation, the predicted Receiver Power would be:

$$\text{Rcvr Pwr (theory)} = +40\text{dBm} - 0.3\text{dB} + 11\text{dBi} - 127\text{dB} + 12\text{dBi} - 3.2\text{dB} = -67.5\text{dBm}$$

Measurements made on the Hi-Des model HV-110 DVB-T receiver showed it had a sensitivity of -97dBm, or -100dBm when used with a low noise preamp [3]. However, these measurements were done in a closed circuit environment with no multi-path present.

Don measured a receive margin of 6dB when using his preamp. This would imply that the received power was probably  $-100\text{dBm} + 6\text{dB} = -94\text{dBm}$ , whereas the Hi-Des receiver reported -91dBm, only a 3dB difference. While theory predicted -67.5dBm at the receiver, we actually encountered an additional -24dB of path loss.

The Cheyenne to Boulder path was a nearly ideal path with no intermediate obstructions as shown by the path profile calculated by Google Earth, Fig. 4. The 24dB of extra path loss was consistent with earlier DVB-T propagation experiments on shorter paths.

Fig.5 below and on next page

**References:** (note: KH6HTV Video application notes available at: [www.kh6htv.com](http://www.kh6htv.com))

1. "New Digital TV DX Record", Jim Andrews, QST, May, 2012, pp. 88-89.
2. "Digital TV DX Record for Colorado", Application Note AN-11, KH6HTV Video, Nov. 2011
3. "DVB-T, the Solution for Ham Digital Television", Application Note AN-17, KH6HTV Video, July. 2014
4. "TV Propagation & Multi-Path Effects", Application Note, AN-7a, KH6HTV Video, Oct. 2012
5. "Antennas for Ham TV", Application Note, AN-4, KH6HTV Video, Sept. 2011

Fig. 4 RF path profile from Cheyenne, Wyoming to N0YE's qth in Boulder, Colorado. Note: this does not include corrections for the curvature of the earth.

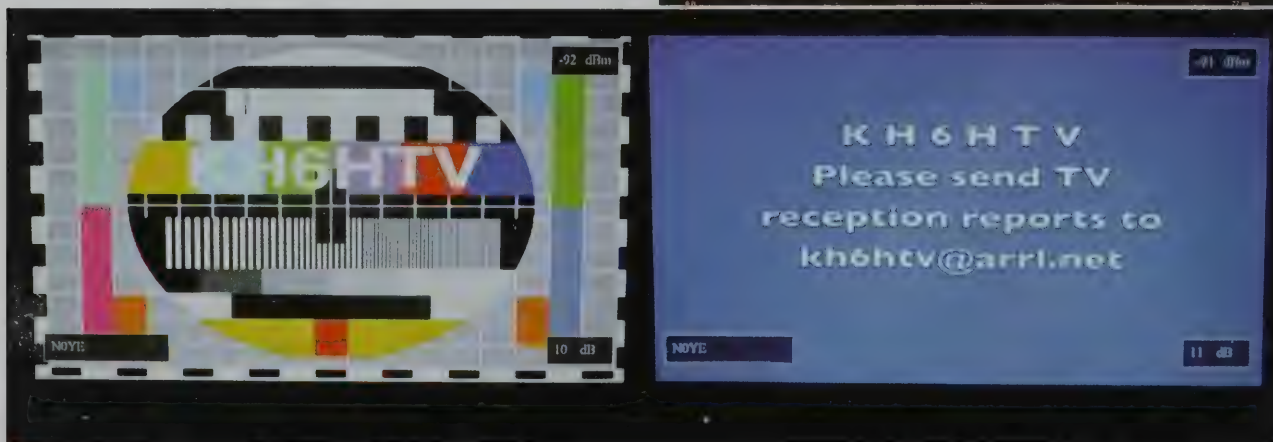




Fig. 5 Various images received by N0YE from KH6HTV.

Composite video is from a pre-recorded DVD slide show.



Note: upper right hand corner displayed signal strength in dBm (no pre-amp). The lower right hand corner displays the S/N in dB.

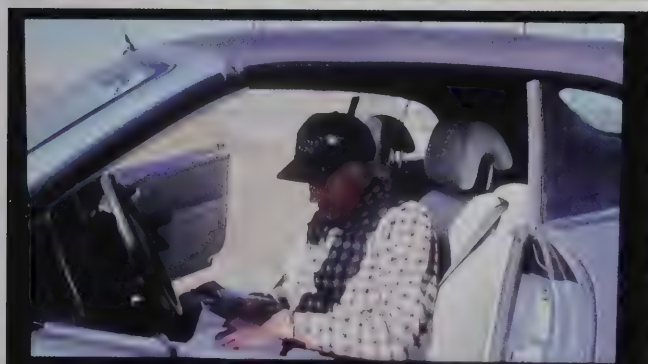


Fig. 6 Live Hi Def, 1080P images received by N0YE in Boulder, CO from KH6HTV in Cheyenne, WY. A Canon hi-def, 1080P, camcorder was used. Images are of KH6HTV in Saab convertible, the AT&T microwave tower and Cheyenne TV towers, and my 70cm, 6 element transmitting Yagi antenna, wide-angle view to south towards Boulder 77 miles away, with I-25 in left side of photo.

73, Jim KH6HTV





## Linking ATV Repeaters

-Mike Collis WA6SVT



ATN has a linked ATV repeater system in California and Nevada for years. We are about a year out from connecting to our Arizona chapter of ATN with their linked system. Along the way we learned a lot about linking, made mistakes and learned from both.



Above are two on-screen photos of our latest addition; a combination slide show ID screen with link telemetry and diagnostic system. Over 20 years ago we pioneered the use of using an Amiga computer with our own programming to provide the slide show ID and input source telemetry. Over a year ago our last Amiga computer died and we resorted to a color bar generator with call sign overlay. A new system was needed and thanks to Perry Locke and Norm Musselman KN6CV we have moved into the 21 century of ID and telemetry.

The new system is based on a Raspberry Pi mini computer with a telemetry daughter board and custom software. The system monitors the following items and capable of much more down the road:

1. Video ID screens
2. Overlaid local receivers' frequency and RX level
3. Link receivers' location signal source and RX level
4. TX power and PA temperature
5. Diagnostic screen call up
6. Announcement screen
7. Local WX screen
8. Camera AZ / Elevation

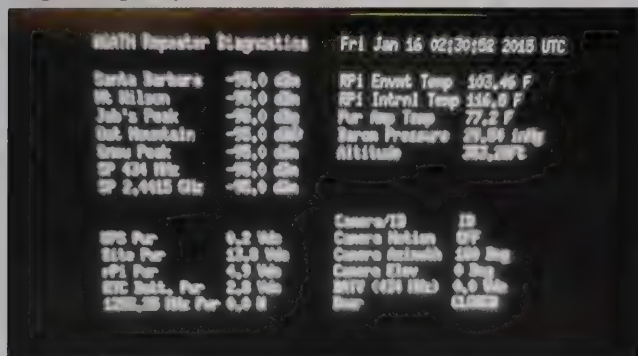
This is just the beginning. All the above is also available via IP. Updates, announcements, new photos etc. can be uploaded via IP saving a drive up the mountain to update the computer. In a future issue an article specific to this system may be published. Note the -95



dBm is not the true signal. I have not yet hooked up the receivers signal level (AGC) line at the time of the photos. Our Oat Mt. 8 ft dish with Steve Noll WA6EJO's 3 band dish feed and a 10 ft Grid at Santa Barbara provides the gain needed for a robust links to Santiago Peak over 60 and 124 mile path distances.



If you notice, both links are on the same frequency, using FM modulation, dish antennas and polarization allow frequency reuse. Those two sites are only 12 degrees apart yet no cross QRM is observed.



Above is one of the diagnostic screens. Not all the inputs have been connected at time of photo. Below is a weather screen shot.



ATN has QAM-64 70cm receivers active at Both Mt. Wilson and Santiago Peak and DVB-T equipment has arrived. We plan to add the DVB-T DATV mode to 70cm input soon. We have been experimenting with QAM-64 and soon DVB-T at Mt Wilson's output. Currently analog is still the most requested output requested. We hope the addition of DVB-T will change that. It should be noted that all our ATV repeaters in the southwest states have 2441.5 MHz FM input. FM allows nearly HD quality video bandwidth as compared to VSB (old OTA TV standard). In our case the links and FM inputs have 5.5 MHz video bandwidth. VSB is about 4.2 MHz. This helps keep video crisp over multiple links.



Equipment is not all that is needed for a successful linked repeater system. Strategically located sites are needed but not always available in some cases. The photo located on the lower left of the page is an example of a strategically located site at White Tank Mountain near Phoenix, Arizona which has a commanding view over a populated area. Obtaining a good written lease and relationship with the landlord is a



must! This helps obtain the best antenna mounting locations for the antennas. Above right side of tower our 70cm and 2441.5 RX antennas are on top in the RX bay where the noise level is usually lower than the TX tower level lower down the tower. Our TX is just below the RX antennas. No one wants their RX antenna next to a high power transmitter antenna. Helix is a must on commercial sites, no coax allowed! To many issues with RF leakage.

Filters on all RF inputs and outputs, no exceptions! No one wants to hear or see your TX white noise and out of channel IMD. Your receiver needs a filter to avoid brute force overload from all the transmitters on site. No plastic cabinets and chassis please, leave them at home and repackage equipment in RF tight enclosures and keep your install neat and professional (will keep the site manager happy) for best performance.

While speaking of packaging, I suggest making a standard for ATV receivers and transmitters. This makes it much easier to maintain multiple repeaters to change a module (RX or TX). Take the broken unit back home to be fixed then put it on the spares shelf for the next site that has a problem. I can take a receiver or transmitter to any ATN repeater in Arizona, California or Nevada and swap it out with a couple of screws, base-band/power (multi pair) and antenna and be on my way back down the mountain.



Once in awhile you have to build your own site. One at my mountain top QTH required a new larger tower to handle repeater antennas we are moving over from a site we are leaving. I thought this was hard work. Then we obtain a BLM lease to build a site from the ground up or should I say below ground in the case of digging tower footings on a rocky desert mountain top by hand due to no easy accessibility for a backhoe. As you can



see above to many boulders at our new site at Ord Mountain. This is our new link site to connect California to Mt. Potosi near Las Vegas just behind Earl KJ6DQR and me 115 miles distance. We thought the digging and rock anchoring was tough but then came mixing the cement by hand! Those boulder and a road from hell that no ready mix truck wanted to



tackle. It was a day to remember hauling over 5 yards of bagged concrete, seven 55 gallon barrels of water then the mixing, 54 bags per pallet, six pallets wow! At least most of the water and one pallet of concrete was staged prior to the day of the pour so the mixing crew could start early. Many thanks to all who helped that day!



Tom WB6HYH, hammer in hand with Gary W6KVC, Craig KF6ZAF and I were busy framing the building. Mark W6MAF donated the tower and helped erect it along with Gary, W6KVC, Norm KD6OMV, Earl KJ6DQR, Nathan KG6AV. The best advice to be successful in building a linked repeater is team work!



Above is part of our team (summer ATN BBQ) who made it all possible  
73, Mike WA6SVT





### The New **GOLD STANDARD** for Amateur FM-TV

KH6HTV Video is proud to introduce it's new 23cm FM-TV line-up. Model 23-1, 3 Watt, 3 channel Transmitter, Model 23-5, 70MHz IF Amp & FM-TV Demodulator and Model 23-7, 3 channel, Down Converter. For detailed specifications, prices and TV application notes see [www.kh6htv.com](http://www.kh6htv.com)

## bob

basic overlay board

Decade Engineering's fourth generation low-cost video information overlay generators make last century's 'OSD' products look antique.

BOB-4 and XBOB-4 let your microcontroller or PC display text and vector graphics on standard TV monitors. With huge user-definable character sets, BOB-4 also supports bitmap graphics and multiple languages. BOB-4 generates background video on-board, or automatically genlocks to your video source and superimposes graphics over the image. Printable characters and commands drive BOB-4 through a fast RS-232 style port, much like a serial terminal or printer.

NTSC and PAL video standards are supported via software command. The free BOB-4 Conscriptor PC program simplifies configuration and font management.



- Simple hookup; requires just 9-12VDC, RS-232 data, video I/O
- Prints plain ASCII text in default configuration
- Display density up to 480x240 (NTSC) or 480x288 (PAL)

**Display text and graphics from your PC on standard TV monitors.**

- Stand-alone operation for video ID, target reticle, etc.
- Automatic vertical scrolling
- Text crawl (single-line smooth horizontal scroll)
- Expanded memory for custom fonts & bitmap graphics

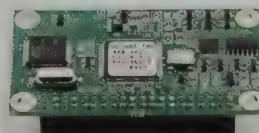


## bob-4h

- Tiny and rugged; industrial temperature option
- Simple hookup; requires just 5VDC, data, video I/O
- Asynchronous 'TTL-232' and SPI control ports
- Prints plain ASCII text in default configuration

**Display text and graphics from your microcontroller on standard TV monitors.**

- Display density up to 480x240 (NTSC) or 480x288 (PAL)
- Text crawl (single-line smooth horizontal scroll)
- Off-board memory expansion for fonts & bitmap graphics
- Software-controlled digital outputs (5)



DECADE ENGINEERING

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TV AMATEUR, page 12,

## ATV greetings by DH7AEQ from Paraguay,

AGAF member Detlef, DH7AEQ, showed up on Sunday, 21. December 2014, at 11.20 h CET via Skype video from his new QTH in Paraguay (ZP), South America, on ATV repeater DB0TGM (Germany). There he talked to ATV friends in Tangermuende (Elbe river) in their club station, who also showed up via ATV. I found that live video in my Cologne home on the Internet stream of DB0TGM that is active 24/7 under <http://atvstream.mo00.com:8180/db0tgm.ogv.m3u>

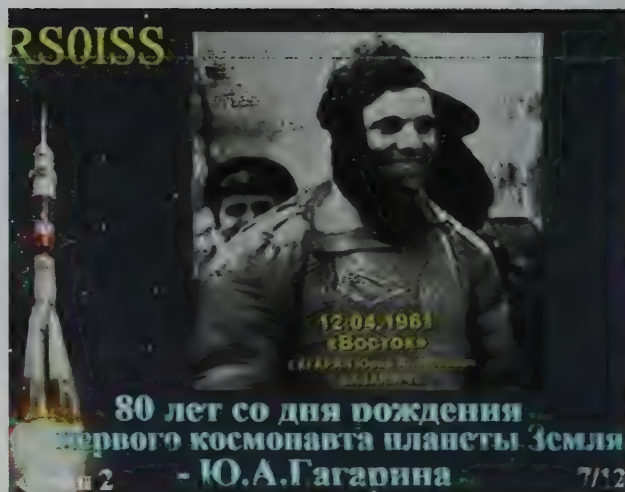
The streaming server with more than 50 ATV streams via Internet and HAMNET is overseen by DB0TGM sys-op;

Joerg,DG0CCO, links web page [http://www.atv-stream.de/index.php?option=com\\_frontpage&Itemid=171](http://www.atv-stream.de/index.php?option=com_frontpage&Itemid=171)

Detlef had just migrated to Paraguay and found a shortwave aerial at another flat near-by, but not a radio amateur - it is home of a local FM radio station. He needed to transcribe his german amateur licence and to learn spanish language still, some pictures of his new home are shown on his homepage <http://dh7aeq.de/>



Patio table in Caacupe, Paraguay, RX: TM732E, laptop computer with MMSSTV V1.13A for SSTV reception from ISS on 145,800 MHz FM



One of 12 images of first Cosmonaut Yuri Gagarin, transmitted from ISS in SSTV mode PD180 on 31.1.2015, see also <http://ariss-sstv.blogspot.de/> for schedule updates.

DH7AEQ is also to be seen regularly via Skype video in the early bird ATV net at 8 hours am (while his own local time is 4 hours!) on work days under DB0EUF repeater stream address <http://atvstream.mo00.com:8100/db0euf.ogv.m3u>

A daily replay is shown on the DB0TGM stream at 11 and 22 h local time, web link see above. The link address is put into VLC player under menu item "open network stream", and then click "play-back".

Klaus, DL4KCK

TV AMATEUR, page 22

## DVB-T live from edge of space

In October 2014 HB9AW (Switzerland) succeeded in receiving the first ever DVB-T live video in HD quality on 70 cm from edge of space. The high altitude balloon video camera shot the whole flight up to 36500 m peak height and back transmitting live in 2 MHz RF bandwidth with only 500 mW power.

On the ground at Kanton school Sursee brilliant HD video was recorded, even at 100 km distance a steady signal was received thanks to circular antennas and OFDM modulation from a HiDes transmitter (info: DH6MAV.)

### TV DX legend Scholli 80 years old

Hans Scholz (called "Scholli") from eastern Germany has been chasing TV DX signals since 1954. His best DX was an "Indian Head" test chart from Oklahoma, USA, in b/w received via multi hop propagation and cashed by photo camera, as it was usual before VCR and PVR. In the eighties he built up a big parabolic dish (1,80 Meters) with H/V controller for receiving the first telecommunication satellites from USSR and USA (MTV was his passion).



Later on he had to ask for permission to receive the early european "birds" by travelling to Dusseldorf (Western Germany) to Bundespost authorities. In the new century he was one of the first viewers of HDTV tests on Astra satellite from "EURO1080" (Belgium) in 2003 and again with first Side-by-Side 3D TV tests from Italy (2009). Still he loves to find 3D TV feeds (and is fond of having a "real 3D" TV test chart from BSkyB), but also Ultra HD TV (4K) demo transmissions on Astra (SES) and Hotbird (Eutelsat).

His latest goodies are a wideangle double reflector parabolic dish with 15 LNBS side by side and recently a cheap Samsung UE40HU6900 UHD TV set able to receive the latest HEVC 50 fps demos with 10 bit colour depth.

### Obituary for Rijn Muntjewerff (1933-2014)

Rijn died on 27.11.2014 in a nursing home near Middenbeemster, Netherlands, where he lived with his wife Ria for some years. Starting his TV DX chase in 1961, he soon erected a 22 Meter tower for rotatable aerials. His special equipment was a b/w Philips TV set able to receive 3 different TV standards. Test charts were documented

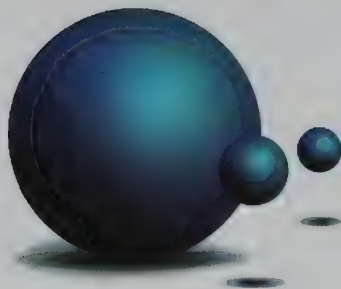
by photo camera, film processing and print multiplying included. He was TV and ATV DX reporter for the AGAF magazine TV-AMATEUR, but in 2011 he had to stop his hobbies for health reasons. Until then he received more than 2000 TV stations from 71 countries and 5 continents, also 550 amateur TV stations. Another hobby was Dahlia farming getting him many tributes. AGAF board and TV-AMATEUR staff will save his memory for ever.



Translations: Klaus, DL4KCK  
[www.agaf.de](http://www.agaf.de)

*Many thanks to TV AMATEUR and Klaus DL4KCK for the translation, Ed.*





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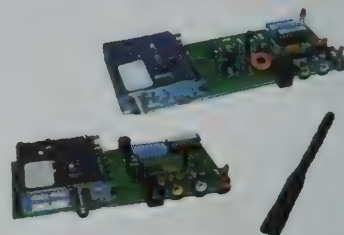
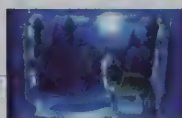
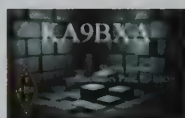
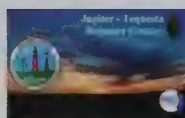
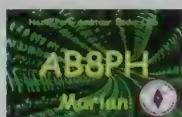
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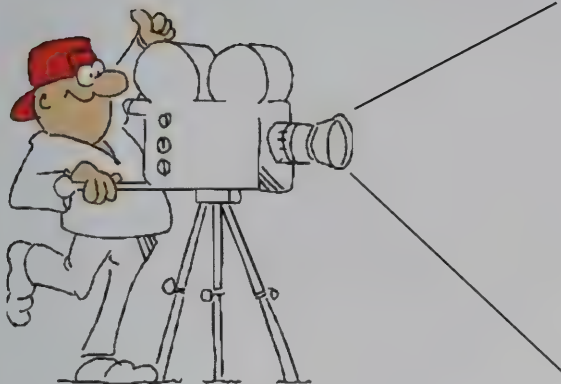
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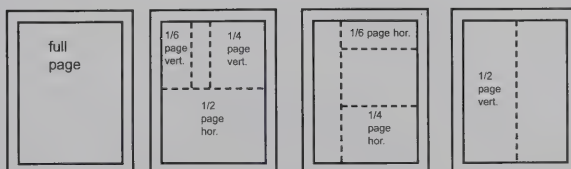
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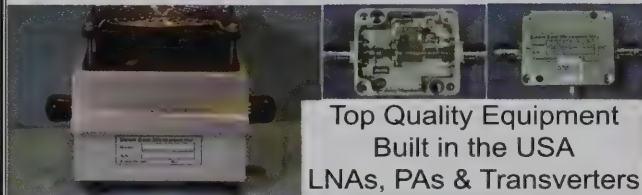
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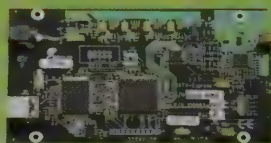


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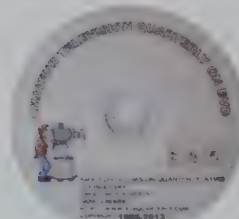
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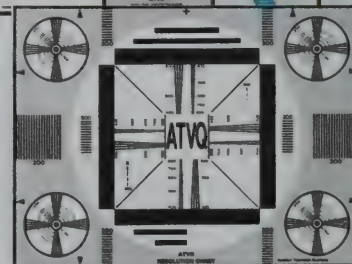
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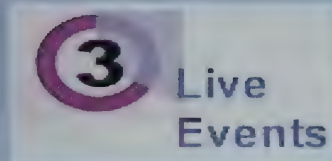
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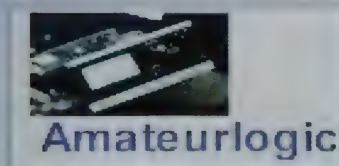
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## ATV News Snippets

-ATVQ Staff

### Rolf Heidemann DH1SBJ & Mike Collis WA6SVT



Dr. Rolf Heiderman DH1SBJ has been in the Los Angeles area for the past couple of weeks on business and dropped by a local ATVer Don Hill KE6BXT's QTH to see his ATV station and ATV operation in California.

Rolf enjoyed seeing many of the local ATVers via the Amateur television Network (ATN) linked repeater system. He has been interested in microwave, ATV and HamNet and other leading edge communications. Rolf wanted to see an American broadcast station and stopped by for a short visit.

He left his jacket so I invited Rolf up for a visit the next day at my QTH to pick up his jacket. Rolf and I had a great time talking about ATV in Germany and the USA. He liked my green tower (featured in a past issue of ATVQ). He asked if he

could take photos of it. The tower is 2 sections of Rohn 45 and a top section of 25 in the top of a Douglas Fir tree over about 120 ft (about 40 meters) up at my mountain top QTH with waveguide and large Heliac cable attached with hangers all the way up.

The following Saturday he car pooled with Don Hill KE6BXT to the ATN monthly breakfast at Flo's Diner at Chino Airport and met several ATN members.

### Ham Radio Celebrates Hollywood



A Ham Radio open house on the set of Last Man Standing TV show on ABC starring Tim Allen along with the Papa Repeater system sponsored the event held September 28, 2014. The event allowed hams to talk to the cast (many are licensed hams) via the Papa repeaters and Don Hill KE6BXT from Amateur TV Network (ATN) provided the streaming video of the event. Last Man standing is filmed on stage 9 at the CBS Studio Center in Studio City, California next door to North Hollywood.

As luck would have it, I was called in for work early at CBS's KCBS TV (at Mt. Wilson) that day and missed the event.

73,  
Mike WA6SVT

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Preferred method of receiving articles is from **Microsoft Word**, **Open Office** or **ASCII Text**, followed by **typewritten** or **hand written** (clearly). Diagrams or pictures (B&W or Color) can be sent in hard copy, or if you scan them in, save to TIF, JPG or BMP formats (actually I can read about anything). If you send a computer disk, make sure it is PC (not MAC) format. When sending in digital photos or scanned photos, please send us the highest possible resolution for best quality when we print it.

Article submissions can be sent to:

**Bill Brown WB8ELK**  
107 Woodlawn Dr.  
Madison, AL 35758

or to our email address: [wb8elk@atvquarterly.com](mailto:wb8elk@atvquarterly.com)

Also note our web page address: <http://www.atvquarterly.com>

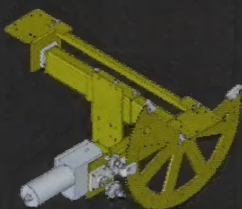




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## Payment for Technical Articles

ATVQ will pay for certain articles that it publishes. I will outline the policy here, but it will be subject to change as needed to make sure that ATVQ continues to be an ongoing publication. ATVQ will pay \$25.00 for technical articles that are published and are a minimum of 2 pages. While this is not a great amount, I hope it will encourage more technical type articles to be written. Exceptions will be articles that are written by a manufacturer/seller of equipment that is being written about. While I do not want to discourage this type of article, the article itself is an advertisement of the product. Articles from clubs will be encouraged, and I would expect they would like to share their information with the ATVQ readership. Information gathered from the Internet will not be paid for and is mostly small filler items.

## Ideas

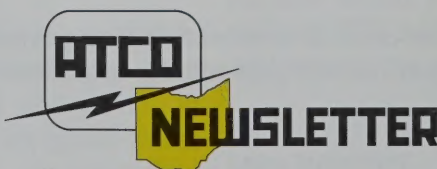
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# ATN

## The Amateur Television Network

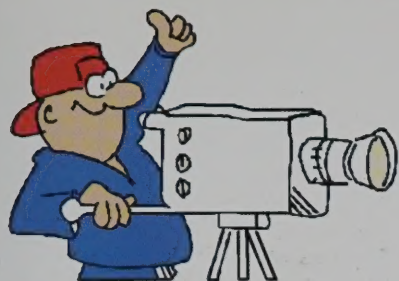
Looking for an ATV club? We have chapters in several states across the country. Most chapters have linked ATV repeaters to allow ATV contacts over long distances. Check out our website [www.atn-tv.org](http://www.atn-tv.org)



ATV In Central Ohio is an ATV club in Columbus and our repeater WR8ATV was the first in the USA to add DATV. The club newsletter is sent not only to the local area but to several

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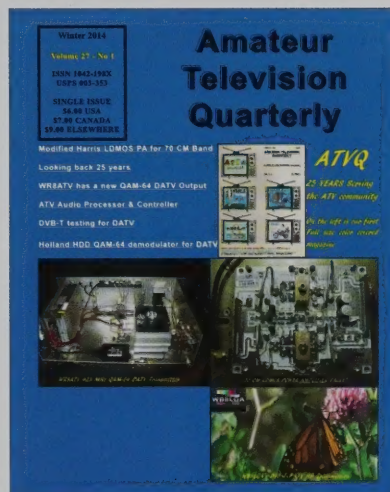
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## SECRETS I & II hard copy is back!

We have just received a very limited supply of ATV Secrets volume I & II hard copy from the Henry AA9XW. These were in storage for several years in good condition.

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